

WHAT IS CLAIMED IS:

1. An optical transmission system transmitting a plurality of electrical signals via an optical transmission path after frequency division multiplexing, said system comprising:

5    a plurality of amplitude modulation parts for receiving each corresponding transmitting data, and amplitude-modulating carriers of differing frequencies by the transmitting data;

10    a frequency division multiplex part for receiving a resultant amplitude modulated signal from each of said amplitude modulation parts, and multiplexing said amplitude modulated signals and outputting a frequency division multiplex signal;

15    an intensity modulation part for intensity modulating an optical signal by said frequency division multiplex signal, and outputting the intensity-modulated optical signal to said optical transmission path;

20    an external modulation part for intensity modulating said intensity-modulated optical signal this time by an electrical signal equal in frequency to any one of the carriers used in said plurality of amplitude modulation parts; and

an optical-electrical conversion part for converting, by square detection, said optical signal provided by said external modulation part into an electrical signal.

2. The optical transmission system according to claim 1,

wherein

    said transmitting data includes digital data, and  
    said plurality of amplitude modulation parts each include

5 a digital amplitude modulation part for subjecting the carriers  
of differing frequencies to digital amplitude modulation by said  
digital data.

3. The optical transmission system according to claim 1,  
further comprising means for extracting, from the electrical  
signal obtained by conversion in said optical-electrical  
conversion part, any one transmitting data desired.

4. The optical transmission system according to claim 1,  
wherein said external modulation part includes a semiconductor  
optical amplifier.

5. The optical transmission system according to claim 4,  
wherein

    said transmitting data includes digital data, and  
    said plurality of amplitude modulation parts each include  
5 a digital amplitude modulation part for subjecting the carriers  
of differing frequencies to digital amplitude modulation by said  
digital data.

6. The optical transmission system according to claim 4,

~~further comprising means for extracting, from the electrical signal obtained by conversion in said optical-electrical conversion part, any one transmitting data desired.~~

7. An optical transmission system transmitting a plurality of electrical signals via an optical transmission path after frequency division multiplexing, said system comprising:

5 a plurality of optical transmission parts for each transmitting an optical signal varied in optical frequency;

10 an optical multiplex part for receiving and multiplexing said optical signals, and outputting a resultant optical signal to said optical transmission path; and

15 an optical separation part for separating the optical signal coming through said optical transmission path into a plurality of optical signals based on an optical frequency;

for each of said optical signals obtained through separation,

20 an external modulation part for intensity modulation by an electrical signal of predetermined frequency; and

an optical-electrical conversion part for converting said optical signal provided by said external modulation part, by square detection, into an electrical signal, and

said plurality of optical transmission parts each comprise:

25 a plurality of amplitude modulation parts for receiving each corresponding transmitting data, and

amplitude-modulating carriers of differing frequencies by the transmitting data;

25 a frequency division multiplex part for receiving a resultant amplitude modulated signal from each of said amplitude modulation parts, and multiplexing said amplitude modulated signals outputting a frequency division multiplex signal; and an intensity modulation part for intensity modulating an optical signal by said frequency division multiplex signal, and outputting the intensity-modulated optical signal to 30 said optical transmission path.

8. The optical transmission system according to claim 7, wherein

said transmitting data includes digital data, and said plurality of amplitude modulation parts each include 5 a digital amplitude modulation part for subjecting the carriers of differing frequencies to digital amplitude modulation by said digital data.

9. The optical transmission system according to claim 7, further comprising means for extracting, from the electrical signal obtained by conversion in said optical-electrical conversion part, any one transmitting data desired.

10. An optical transmission system transmitting a

~~plurality of electrical signals via an optical transmission path~~

after frequency division multiplexing, said system comprising:

a plurality of amplitude modulation parts for receiving

5 each corresponding transmitting data, and amplitude-modulating  
carriers of differing frequencies by the transmitting data;

a frequency division multiplex part for receiving a  
resultant amplitude modulated signal from each of said amplitude  
modulation parts, and multiplexing said amplitude modulated

10 signals and outputting a frequency division multiplex signal;

an intensity modulation part for intensity modulating an  
optical signal by said frequency division multiplex signal, and  
outputting the intensity-modulated optical signal to said optical  
transmission path; and

15 an optical-electrical conversion part for converting, by  
square detection, said optical signal provided by said external  
modulation part into an electrical signal, wherein,

superposed on a bias voltage or a bias current of said  
optical-electrical conversion part is an ~~electrical~~ signal whose  
20 frequency is equal to any one of the carriers used in said plurality  
of amplitude modulation parts.

11. The optical transmission system according to claim 10,

wherein

said transmitting data includes digital data, and

said plurality of amplitude modulation parts each include

5 a digital amplitude modulation part for subjecting the carriers  
of differing frequencies to digital amplitude modulation by said  
digital data.

12. The optical transmission system according to claim 10,  
further comprising means for extracting, from the electrical  
signal obtained by conversion in said optical-electrical  
conversion part, any one transmitting data desired.

13. An optical transmission system transmitting a  
plurality of electrical signals via an optical transmission path  
after frequency division multiplexing, said system comprising:

5 a plurality of amplitude modulation parts for receiving  
each corresponding transmitting data, and amplitude-modulating  
carriers of differing frequencies by the transmitting data;

10 a frequency division multiplex part for receiving a  
resultant amplitude modulated signal from each of said amplitude  
modulation parts, and multiplexing said amplitude modulated  
signals and outputting a frequency division multiplex signal;

a light source for outputting light constant in intensity;

15 a first SSB modulation part for SSB (Single SideBand)  
modulating said light by said frequency division multiplex signal,  
and outputting a resultant optical signal to said optical  
transmission path;

an optical filter part for receiving the optical signal

coming through said optical transmission path, and from the optical signal, extracting an optical carrier component and an optical sideband component;

20 a second SSB modulation part for SSB modulating said optical sideband component by an electrical signal whose frequency is equal to any one of the carriers used in said plurality of amplitude modulation parts;

25 an optical combining part for combining said optical carrier component with a resultant optical signal obtained through SSB modulation in said second SSB modulation part; and

an optical-electrical conversion part for converting, by square detection, a resultant optical signal coming from said optical combining part into an electrical signal.

14. The optical transmission system according to claim 13, wherein

said transmitting data includes digital data, and

said plurality of amplitude modulation parts each include

5 a digital amplitude modulation part for subjecting the carriers of differing frequencies to digital amplitude modulation by said digital data.

15. The optical transmission system according to claim 13, further comprising means for extracting, from the electrical signal obtained by conversion in said optical-electrical

conversion part, any one transmitting data desired.

16. An optical transmission system transmitting a plurality of electrical signals via an optical transmission path after frequency division multiplexing, said system comprising:

5 a plurality of amplitude modulation parts for receiving each corresponding transmitting data, and amplitude-modulating carriers of differing frequencies by the transmitting data;

10 a frequency division multiplex part for receiving a resultant amplitude modulated signal from each of said amplitude modulation parts, and multiplexing said amplitude modulated signals and outputting a frequency division multiplex signal;

15 a light source for outputting light constant in intensity; a first SSB modulation part for SSB modulating said light by said frequency division multiplex signal, and outputting a resultant optical signal to said optical transmission path;

20 an optical filter part for receiving the optical signal coming through said optical transmission path, and from the optical signal, extracting an optical carrier component and an optical sideband component;

25 a second SSB modulation part for SSB modulating said optical carrier component by an electrical signal whose frequency is equal to any one of the carriers used in said plurality of amplitude modulation parts;

an optical combining part for combining said optical

25 ~~sideband component with a resultant optical signal obtained~~  
through SSB modulation in said second SSB modulation part; and  
an optical-electrical conversion part for converting, by  
square detection, a resultant optical signal coming from said  
optical combining part into an electrical signal.

17. The optical transmission system according to claim 16,  
wherein

5 said transmitting data includes digital data, and  
said plurality of amplitude modulation parts each include  
a digital amplitude modulation part for subjecting the carriers  
of differing frequencies to digital amplitude modulation by said  
digital data.

18. The optical transmission system according to claim 16,  
further comprising means for extracting, from the electrical  
signal obtained by conversion in said optical-electrical  
conversion part, any one transmitting data desired.

19. An optical transmission system transmitting a  
plurality of electrical signals via an optical transmission path  
after frequency division multiplexing, said system comprising:  
5 a plurality of optical transmission parts for each  
transmitting an optical signal varied in optical frequency;  
an optical multiplex part for receiving and ~~multiplexing~~

~~said optical signals, and outputting a resultant optical signal to said optical transmission path;~~

10       an optical filter part for receiving the optical signal coming through said optical transmission path, and from the optical signal, extracting an optical carrier component and an optical sideband component;

15       a second SSB modulation part for SSB modulating said optical sideband component by an electrical signal of predetermined frequency;

20       an optical combining part for combining said optical carrier component with a resultant optical signal obtained through SSB modulation in said second SSB modulation part; and

25       an optical-electrical conversion part for converting, by square detection, a resultant optical signal coming from said optical combining part into an electrical signal, and

30       said plurality of optical transmission parts each comprise:

20       a plurality of amplitude modulation parts for receiving each corresponding transmitting data, and amplitude-modulating carriers of differing frequencies by the transmitting data;

30       a frequency division multiplex part for receiving a resultant amplitude modulated signal from each of said amplitude modulation parts, and multiplexing said amplitude modulated signals and outputting a frequency division multiplex signal;

35       a light source for outputting light constant in

intensity, and

a first SSB modulation part for SSB modulating said light by said frequency division multiplex signal.

20. The optical transmission system according to claim 19,

wherein

said transmitting data includes digital data, and

said plurality of amplitude modulation parts each include

5 a digital amplitude modulation part for subjecting the carriers of differing frequencies to digital amplitude modulation by said digital data.

21. The optical transmission system according to claim 19, further comprising means for extracting, from the electrical signal obtained by conversion in said optical-electrical conversion part, any one transmitting data desired.

22. The optical transmission system according to claim 19, wherein said optical filter part comprises an optical filter which shows periodicity to wavelength, and a variable wavelength filter which passes only light of desired wavelength and can be varied 5 in band for passing.

23. The optical transmission system according to claim 22, wherein

~~said transmitting data includes digital data, and~~  
~~said plurality of amplitude modulation parts each include~~  
5 a digital amplitude modulation part for subjecting the carriers  
of differing frequencies to digital amplitude modulation by said  
digital data.

24. The optical transmission system according to claim 22,  
further comprising means for extracting, from the electrical  
signal obtained by conversion in said optical-electrical  
conversion part, any one transmitting data desired.

25. An optical transmission system transmitting a  
plurality of electrical signals via an optical transmission path  
after frequency division multiplexing, said system comprising:

5 transmitting an optical signal varied in optical frequency;

an optical multiplex part for receiving and multiplexing  
said optical signals, and outputting a resultant optical signal  
to said optical transmission path;

an optical filter part for receiving the optical signal  
10 coming through said optical transmission path, and from the  
optical signal, extracting an optical carrier component and an  
optical sideband component;

a second SSB modulation part for SSB modulating said optical  
carrier component by an electrical signal of predetermined

15 frequency:

an optical combining part for combining said optical sideband component with a resultant optical signal obtained through SSB modulation in said second SSB modulation part; and

20 an optical-electrical conversion part for converting, by square detection, a resultant optical signal coming from said optical combining part into an electrical signal, and

said plurality of optical transmission parts each comprise:

25 a plurality of amplitude modulation parts for receiving each corresponding transmitting data, and amplitude-modulating carriers of differing frequencies by the transmitting data;

30 a frequency division multiplex part for receiving a resultant amplitude modulated signal from each of said amplitude modulation parts, and multiplexing said amplitude modulated signals and outputting a frequency division multiplex signal;

a light source for outputting light constant in intensity; and

a first SSB modulation part for SSB modulating said light by said frequency division multiplex signal.

26. The optical transmission system according to claim 25, wherein

said transmitting data includes digital data, and

said plurality of amplitude modulation parts each include

5 a digital amplitude modulation part for subjecting the carriers of differing frequencies to digital amplitude modulation by said digital data.

27. The optical transmission system according to claim 25, further comprising means for extracting, from the electrical signal obtained by conversion in said optical-electrical conversion part, any one transmitting data desired.

28. The optical transmission system according to claim 25, wherein said optical filter part comprises an optical filter which shows periodicity to wavelength, and a variable wavelength filter which passes only light of desired wavelength and can be varied in band for passing.

5 29. The optical transmission system according to claim 28, wherein

said transmitting data includes digital data, and  
said plurality of amplitude modulation parts each include

a digital amplitude modulation part for subjecting the carriers of differing frequencies to digital amplitude modulation by said digital data.

30. The optical transmission system according to claim 28, further comprising means for extracting, from the electrical

signal obtained by conversion in said optical-electrical conversion part, any one transmitting data desired.

31. An optical receiver for reproducing any desired electrical signal from an optical signal intensity modulated by a frequency division multiplex signal having a plurality of amplitude-modulated electrical signals multiplexed thereon,

5 said receiver comprising:

an external modulation part for intensity modulating said optical signal by an electrical signal of predetermined electrical signal; and

10 an optical-electrical conversion part for converting, by square detection, said optical signal provided by said external modulation part into an electrical signal.

32. An optical receiver for reproducing any desired electrical signal from an optical signal intensity modulated by a frequency division multiplex signal having a plurality of amplitude-modulated electrical signals multiplexed thereon,

5 said receiver comprising:

a local oscillation signal source for outputting an electrical signal of a predetermined frequency; and

10 an optical-electrical conversion part for converting said optical signal into an electrical signal by square detection,

wherein

~~superposed on a bias voltage or a bias current of said~~  
optical-electrical conversion part is the electrical signal from  
said local oscillation signal source.

33. An optical receiver for reproducing any desired  
electrical signal from an optical signal SSB (Single SideBand)  
modulated by a frequency division multiplex signal having a  
plurality of amplitude-modulated electrical signal multiplexed  
thereon, said receiver comprising:

an optical filter part for extracting an optical carrier  
component and an optical sideband component from said optical  
signal;

an SSB modulation part for SSB modulating said optical  
sideband component by an electrical signal of predetermined  
frequency;

an optical combining part for combining said optical  
carrier component with a resultant optical signal SSB modulated  
by said SSB modulation part; and

15 an optical-electrical conversion part for converting, by  
square detection, said SSB-modulated optical signal into an  
electrical signal.

34. An optical receiver for reproducing any desired  
electrical signal from an optical signal SSB (Single SideBand)  
~~modulated by a frequency division multiplex signal having a~~

~~Plurality of amplitude-modulated electrical signal multiplexed~~

5 thereon, said receiver comprising:

an optical filter part for extracting an optical carrier component and an optical sideband component from said optical signal;

10 an SSB modulation part for SSB modulating said optical carrier component by an electrical signal of predetermined frequency;

15 an optical combining part for combining said optical sideband component with a resultant optical signal SSB modulated by said SSB modulation part; and

20 an optical-electrical conversion part for converting, by square detection, said SSB-modulated optical signal into an electrical signal.

35. An optical receiver for reproducing any desired electrical signal from a multiplexed optical signal which is structured by a plurality of optical signals SSB (Single SideBand) modulated by a frequency division multiplex signal having a 5 plurality of amplitude-modulated electrical signal multiplexed thereon, said receiver comprising:

an optical filter part for extracting, from said multiplexed optical signal, an optical carrier component and an optical sideband component of one of said plurality of optical 10 signals;

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~~an SSB modulation part for SSB modulating said optical sideband component by an electrical signal of predetermined frequency;~~

15 ~~an optical combining part for combining said optical carrier component with a resultant optical signal SSB modulated by said SSB modulation part; and~~

~~an optical-electrical conversion part for converting, by square detection, said SSB-modulated optical signal into an electrical signal.~~

36. The optical receiver according to claim 35, wherein said optical filter part comprises an optical filter which shows periodicity to wavelength, and a variable wavelength filter which passes only light of desired wavelength and can be varied in band 5 for passing.

37. An optical receiver for reproducing any desired electrical signal from a multiplexed optical signal which is structured by a plurality of optical signals SSB (Single SideBand) modulated by a frequency division multiplex signal having a 5 plurality of amplitude-modulated electrical signal multiplexed thereon, said receiver comprising:

~~an optical filter part for extracting, from said multiplexed optical signal, an optical carrier component and an optical sideband component of one of said plurality of optical~~

10 ~~signals;~~

an SSB modulation part for SSB modulating ~~said optical~~  
carrier component by an electrical signal of predetermined  
frequency;

15 an optical combining part for combining said optical  
sideband component with a resultant optical signal SSB modulated  
by said SSB modulation part; and

an optical-electrical conversion part for converting, by  
square detection, said SSB-modulated optical signal into an  
electrical signal.

38. The optical receiver according to claim 37, wherein  
said optical filter part comprises an optical filter which shows  
periodicity to wavelength, and a variable wavelength filter which  
passes only light of desired wavelength and can be varied in band  
5 for passing.

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